

Orbiter-Class Mission: Launch-no-later-than Dates

		Uranus	Neptune	Dual
Best Launch Years (JGA)		2030-2034	2029-2030	2031
Launch Class	S/C Propulsion			
DeltaIV-H	Chemical	2035	2029	n/a
	SEP	Any	2030	n/a
	AC Blunt/Ellipsled	? / Any	None* / Any	? / ?
SLS-Block1B	Chemical	Any	2031	n/a
	SEP	Any	Any	2031
	AC Blunt/Ellipsled	? / Any	None* / Any	? / ?
DeltaIV-H	SEP		Any	n/a
Legend		TOF < 12 yrs	TOF < 13 yrs	
(TOF is interplanetary portion only)			TOF < 20-25 yrs	

-JGAs confer a significant advantage in delivered mass and flight time.

-JGA is available for a few years around 2030; next Launch opportunity w/ JGAs is around 2046.

-Launching after indicated dates results in insufficient mass delivered for orbiter-class mission.

-* AC is Aerocapture w/ chem interplanetary. For Neptune, AC w/ Blunt Body may be possible w/ JGA, but not possible w/o it.

Aerocapture notes

- Chemical propulsion assumed for the interplanetary portion
- For Neptune
 - For Blunt-Body ($L/D < 0.2$) capture, an arrival v -infinity of $> \sim 28$ km/s is required to give a Corridor Width of $> \sim 1$ deg. A one-degree Corridor Width may be just below the limit of what is reasonable; values of 1.5-2deg are typically used, but there may be some hope to push below 1.5 deg.
 - In the case of no JGA, the arrival v -infinity, regardless of launch vehicle, will be too low (~ 10 -18 km/s) to use a blunt body – the Corridor Width is < 0.5 deg for these conditions, which is at least a factor of three smaller than what is needed for reliable capture.
 - In the case of a JGA, the arrival v -infinity can be higher than the no JGA case – just how high needs to be analyzed, but 28 km/s seems like a stretch.
 - For Ellipsled (L/D 0.6-0.8) capture, the Corridor width of 1.5-2deg is attainable w/ low arrival v -infinities (14-20 km/s), and so is possible with and without JGA. But D-IVH and SLS both need gravity-assist trajectories (VEEGA etc). The SLS does not throw enough mass to go on a direct trajectory with a high enough arrival v -inf.
- For Uranus
 - For Blunt Body, analysis is needed to see if JGA and/or SLS can give high enough v -infs
 - For Ellipsled, it will work. Feasibility of direct SLS trajectory – analysis not yet done.